ASCI UPDATE

June 2001

PSE Milepost Review

The ASCI PSE/DisCom² Milepost Review Panel, consisting of academic, government, and Department of Energy national laboratory experts, met in April 2001 to assess whether the functionality and scale requirements of a major milestone for ASCI's Problem Solving Environment (PSE) had been met. The milestone extended the problem solving environment initially created for ASCI's existing supercomputers to ASCI White, a 12 teraOPS system installed at Lawrence Livermore National Laboratory. This work made ASCI White available and usable for developers, designers, and analysts from Lawrence Livermore, Sandia, and Los Alamos national laboratories.

Overall, the Panel found that the PSE program passed all aspects of the milestone, and they commended the tri-lab PSE team for their "demonstrated successes resolving compiler problems, shaking down development tools, dealing with machine access issues, verifying that I/O systems and archival systems were reliably usable, and ensuring that application codes and tools could function at scale."

Specifically, the Panel reported that the ability to generate and run the selected codes was fully demonstrated on the 12 teraOPS system. With regard to input/output capability, the Panel was "very impressed with the functionality of the archives and the leadership that the PSE Team has taken in high-performance storage system." The widespread use of TotalView across the laboratories was also noted. As a result of this success, ASCI users can prepare their codes and debug them on their local platforms as well as the ASCI White systems. The "excellent" research on debugging and hardware counters was commended.

The applications code teams demonstrated that all the milepost codes ran at scale. The PSE team improvement the input/output system capability. The Panel stated that the emphasis on HPSS is "providing a valuable return to PSE and the ASCI program as a whole." They also stated that they were "very impressed" to see TotalView running on 1536 processors and acknowledged the PSE team's effort.

The Panel recommended future integration of PSE capabilities with related programs, generation of a comprehensive ASCI architecture and usability model, closer interface with external users, and the development of performance measurements.

DisCom² Milepost Review

In April 2001, the ASCI PSE/DisCom² Milepost Review Panel met to determine whether the DisCom² FY01 Milepost had been successfully completed as reported in March. The expert team, drawn from universities, government agencies, and other Department of Energy laboratories, heard presentations by the DisCom² program leaders, and the chairman of the panel subsequently attended a demonstration at Sandia/NM during which the DisCom² technology facilitated remote use of the Lawrence Livermore ASCI White system.

The panel concluded that "the DisCom² program passed all requirements for this milestone with flying colors." Achieving the Milepost is a major accomplishment for DisCom² and for ASCI. The capabilities demonstrated during the review showed that it is possible to transmit huge amounts of data 16,000 times faster than internet service providers transmit over telephone lines. The team successfully transmitted 237 gigabytes of data at 100 megabytes per second from ASCI White to a visualization machine at Sandia New Mexico. Since the review, the team has sent terabytes of data from ASCI White to New Mexico.

In the News...

The latest version of ALEGRA, a computer code used to model hostile nuclear weapons environments and more, was released in April.

Upcoming Events...

Preparations are under way for tri-lab ASCI participation in Supercomputing 2001, to be held November 10–16, 2001 in Denver, Colorado. In order to build a strong exhibit of our tri-lab effort, we urge you to consider exhibiting or demonstrating your project. For information visit the "ASCI Exhibit at SC01" web site at http://www.sandia.gov/supercomp/index.html

Who's Who in ASCI Simulation and Computer Science...

DisCom²

Mike Underwood
NNSA Program Manager
michael.underwood@nnsa.doe.gov

Dave Wiltzius
Lawrence Livermore National Laboratory
wiltzius1@llnl.gov

Steve Turpin
Los Alamos National Laboratory
turpin@lanl.gov

Art Hale
Sandia National Laboratory
alhale@sandia.gov

The Distance and Distributed Computing and Communication (DisCom²) program has two key objectives. The first is to extend the environments required to support high-end computing to remote sites, and the second is to develop an integrated supercomputing environment across the nuclear weapons complex to support stockpile stewardship. The Milepost supports the first objective by providing extended classified high-end computing environments for remote tri-lab users and serves as a foundation for addressing the second objective.

The panel singled out major accomplishments:

- High-speed data migration capabilities were found to be effective. The panel was "impressed with the first deployment of a secure OC48 wide-area network" interconnecting the ASCI computer centers.

- The new grid services to allow users to submit and monitor jobs easily on the ASCI White machine at Lawrence Livermore National Laboratory was noted as "usable and effective." Thanks were extended to the DisCom² Team for developing a robust Kerberos security service.

In addition, the panel noted good business practices that included ASCI White web pages that were "timely and comprehensive" for local and remote users. The report noted the importance of the web information to the usability of the distance computing component.

The panel was also "impressed" with the excellent coordination of workflow and support across the three laboratories.

The panel observed that challenges for the future will include a more disciplined methodology to ensure further coordination with other ASCI activities. In addition, the development process will need to be opened to increased input from other teams and users. A more user-driven approach will require additional outreach activities and training support.

In coming months, the DisCom² will work to bring the services to a generally available production state and support an expanding community of ASCI White users.

CSRI Hosts First PDE Solver Workshop

Simulation of physical systems governed by partial differential equations (PDEs) may involve millions of variables, thousands of processors, and multiple physics interactions. Optimizing the performance of large-scale PDE solvers was the central issue confronting participants in the first Workshop on Large-Scale PDE-Constrained Optimization on April 4-6, 2001. The workshop was hosted by the Computer Science Research Institute (CSRI) at Sandia National Laboratories as part of its mission to bring university faculty and students to the national defense laboratories for focused collaborative research on computer and computational science problems.

The spirited discussions that took place during the workshop demonstrated the very different ideas held by the participants and the usefulness of airing differing viewpoints in a workshop setting.

As PDE solvers mature, interest in problems concerning their design and optimization is increasing, as shown by the participants attending the CSRI workshop from the academic, industry, and national laboratory communities. Researchers attended from Carnegie Mellon, Rice, Courant Institute, Florida, Michigan Tech, Old Dominion, William and Mary, North Carolina, Utah, Virginia Tech, Northwestern, and Villanova. Also included in the workshop were researchers from Exxon, Boeing, National Aeronautics and Space Administration, and the DOE laboratories.

The workshop was able to

- Identify needs and opportunities for PDE-constrained optimization in industry and the national defense laboratories,

- Assess the state-of-the-art in PDE-constrained optimization,

- Identify barriers to optimization presented by modern, highly parallel PDE simulation codes,

- Discuss promising algorithmic and software approaches for overcoming these barriers.

Through spirited discussions, participants agreed that current state-of-the-art simultaneous analysis and design methods cannot be applied directly to production-quality PDE-based simulation codes. Considerable research is necessary to address such issues as state Jacobian inexactness, nonsmoothness, transients, and nonglobal Jacobians. Several collaborative projects with these goals were discussed.

The ASCI Update is written and published monthly by the Los Alamos, Sandia, and Lawrence Livermore national laboratories, with contributions from the Department of Energy. This newsletter, along with past editions, may be viewed on the web: www.sandia.gov/ASCI. Comments or inquires should be sent to ASCI@sandia.gov. SAND 2000-2828.